BULL. BOT. SURV. INDIA
Vol. 17, Nos. 1-4: pp. 108-123, 1975

A TAXONOMIC REVISION OF INDO-BURMESE *TRICHODESMA* R. BR. (BORAGINACEAE)

S. P. Banerjee and B. B. Pramanik

Botanical Survey of India, Howrah

ABSTRACT

The genus *Trichodesma*, occurring in tropical and sub-tropical Asia, Africa and Australia has about 45 species. The area taken up for revision is India, Bhutan and Burma. C. B. Clarke in Hook. f. Fl. Brit. India described 5 species and 1 variety from this area. In this paper 7 species and 2 varieties have been described.

INTRODUCTION

Trichodesma R. Br. is a genus with about 45 species, distributed in tropical and sub-tropical Asia, Africa and Australia. C. B. Clarke (1883) described 5 species and one variety from the area under study, which include the Indian Union, Bhutan and Burma. We have described 7 species and 2 varieties from this area which include one new species *T. decurrens* Banerjee (1966) from Burma and *T sedgwickianum* Banerjee (1962), a *nomen novum* based on *T amplexicaule* DC (non Roth).

Although the genus *Borraginoides* Boehmer (1760) is earlier than *Trichodesma* R. Brown (1810), the latter has been retained on account of its being conserved *cf. Nomina Generica Conservanda* no. 7056 of the *International Code of Botanical Nomenclature* (ed. 1972). The conserved type species is *T. zeylanicum* (N. L. Burmann) R. Br. (*Borago zeylanica* N. L. Burmann).

Brand (1921) in his monographic studies treated *Trichodesma* under the following six sections, based on villose or non-villose, compressed or non-compressed nutlets: I. *Trichocaryum* Brand, II. *Acanthocaryum* Brand, III. *Friedrichsthalia* (Fenzl) A. DC. IV. *Ommatocaryum* A. DC., V. *Trachycaryum* A. DC. and VI. *Leiocaryum* A. DC. Plants under the first two sections are restricted to tropical Africa and Arabia. Among the Indo-Burmese species *T. khasianum* Clarke, *T calycosum* Collett et Hemsl. and *T. africanum* (Linn.) Lehm. are placed under Sect. Friedrichsthalia. *T. indicum* (Linn.) Lehm., *T. sedgwickianum* Banerjee, *T. decurrens* Banerjee and *T zeylanicum* R. Br. are placed under the Sect. Leiocaryum.

Brand (1914) segregated *T calycosum* Collett & Hemsl. on account of its invaginate faucal appendages to form the monotypic genus *Lacaitaea*. Of the characters mentioned by him, only the faucal appendages are notable when the plant is compared with *Trichodesma*. They are distinctive of *T calycosum* and constitute the only character of possible generic value. *T. calycosum* shows remarkable similarity to *T. khasianum* except that the latter has absolutely no faucal appendages. It is therefore, arbitrary and unnatural to erect the genus *Lacaitaea* on the basis of a single character *viz.* faucal appendage.

Trichodesma is an annual, biennial or perennial herb or shrub of very different tallness, the average height of the species come to 30-60 cm reaching up to 150 cm or more in *T calycosum* and *T. khasianum*. The

Date of receipt: 23. 4. 75. Date of acceptance: 26. 6. 77

entire shoot system in most species of *Trichodesma* including the pedicel and the calyx is clothed with hairs. They show a small bulbous base with a small prolongation as has been observed in species of *Cynoglossum, Eritrichium, Heliotropium, Lithospermum, Myosotis* and *Symphytum* (Metcalfe and Chalk 1957). The bulbous based hair develops from a group of six to eight enlarged and resiniferous epidermal cells.

The tap root system in herbaceous species reaches up to 20 cm with the upper parts suffruticose *e.g. T indicum* var. *indicum* and in other related taxa, increasing in the shrubby species *e.g. T khasianum*. The stems are slender and more or less covered with strigose hairs. The nodes are often swollen and internodes range from 2-10 cm in the herbaceous species *e.g. T indicum*. In *T africanum* the stem is sparsely covered with setae-like, hispid, prominently white tuberculate hairs often in 3-4 rows. Although the stem is cylindrical in general, it is tetragonous in *T. calycosum*. The leaves are opposite and entire, in some species ciliate or more or less revolute as in some forms of *T indicum*. It is sessile, sub-amplexicaul to amplexicaul, lanceolate, linear lanceolate to ovate oblong or elliptic oblong with tuberculate strigose to more or less hispid hairs on the upper surface, more or less villous or sparingly hirsute specially on the nerves beneath *e.g. T. indicum* var. *indicum* and other varieties. The largest leaves among the Indo-Burmese species occur in *T. calycosum*, reaching up to 42 by 17 cm; densely greyish tomentose and velutinous.

Flowers usually pentamerous, occasionally ranging from tetramerous to hexamerous, solitary on axillary pedicels but passing into terminal racemes by reduction of the floral leaves, as in *T. indicum* and other related taxa. In *T. zeylanicum* flowers are usually arranged in terminal, elongate, bracteate racemes or occasionally in clusters of a few flowers in the upper leaf-axils. In *T. khasianum* flowers are in terminal subpatent cincinni up to 20 cm in diameter. Among the Indo-Burmese species largest inflorescence, up to 35 cm long, is found in *T calycosum* where flowers are arranged in much branched lax paniculate 4-8 flowered subcorymbose clusters.

Pollination: An interesting account of pollination in *T. indicum* by a Hymenopteroid insect has been furnished by Burkill (1908): "There are five ways to the honey, and *Anthophora zonata* (an insect which apparently especially visits this flower) hangs under the cone as it turns round to explore each in turn. The pollen is liberated on to the lower surface of its thorax in this act, if the flower be young and the stigma immature: when the flower is older, the now ripe stigmas project 4 mm from the empty cone and are rubbed by the insect's thorax and pollinated if pollen is there. The ways to the honey are well guarded by hairs."

TRICHODESMA R. BR.

Trichodesma R. Br. Prodr. Fl. Nov. Holland; 496. 1810; Lehm. Pl. Asperifol; 192. 1818; G. Don. Gen. Syst. 4: 311. 1838; A. DC. in DC Prodr. 10: 171. 1846; Benth. et Hook. f. Gen. Pl. 2: 845. 1876; Clarke in Hook. f. Fl. Brit. Ind. 4: 153. 1883; Gurke in Engl. et Prantl, Pflanzenfam. 4. 3a: 99. 1897; Brand in Engl. Pflanzenr. 78: 19. 1921; Kazmi in Journ. Arnold Arbor. 52: 515. 1971; Sant. & Henry, Dic. Fl. Pl. Ind. 174. 1973; nom. gen. cons. Type species: *T zeylanicum* (N. L. Burm.) R. Br. (*Borago zeylanica* N. L. Burm.)-Type cons. *Borraginoides* Boehm. in Ludwig, Def. Gen. Pl. 18. 1760, *nom. rej. Lacaitaea* Brand in Fedde, Repert. 13: 81. 1914 & in Engl. Pflanzenr. 78: 44. 1921.

Erect to somewhat decumbent, coarse, hispid herbs or shrubs, often from a woody root stock, rarely small trees. Leaves opposite, or upper alternate, entire. Flowers solitary, on axillary pedicels, but passing into terminal racemes by gradual reduction of the floral leaves, usually ebracteate, pentamerous but occasionally tetramerous to hexamerous in a few species. Calyx deeply 5-lobed, lobes triangular, lanceolate, accrescent, imbricate, rarely contorted. Corolla gamopetalous, campanulate, cylindiric or 5-gonous, throat naked, or with 8-10 invaginate, gibbose, faucal appendages (*T calycosum*), lobes 5, shortly ovate or lanceolate, often long-acuminate, overlapping to the left, contorted. Stamens 5, on the corolla tube, filaments short, broad, and as well as the connectives, usually hairy on the back, anthers erect, linear oblong, acuminate, connivent in a cone. Ovary 4-lobed, 4-chambered; style terminal, filiform; stigma small; ovules sub-horizontal, attached to the inner angles of the cell. Fruit pyramidal, sub 4-ridged, enclosed in the enlarged persistent calyx, nutlets 4, broad, tuberculate or smooth, with or without a raised entire or pectinate or glochidiate margin, the lower face almost entirely adnate to the torus. Seeds obovoid or sub-orbicular; embryo straight or slightly curved; cotyledons plano-convex.

Species about 45 in tropical and subtropical Asia, Africa and Australia.

KEY TO THE SPECIES AND VARIETIES OF *TRICHODESMA*

A. Fruiting calyx-lobes cordate or hastate at the base :
B. Staminal cone exserted :
C. Outer face of nutlets entire, without a raised margin :
D. Lamina subsessile or sessile more or less sub-amplexicaul to amplexicaul at the base :
E. Leaves crowded, coriaceous, margins more or less revolute, villous beneath ... 1. *T. indicum* var. *indicum*
EE. Leaves distant, chartaceous, margins entire, glabrous beneath except on the midrib and veins :
F. Lamina amplexicaul at the base ... 1a. *T. indicum* var. *amplexicaule*
FF. Lamina not amplexicaul, attenuated into a short petiole ... ... 1b. *T. indicum* var. *subsessilis*
DD. Lamina decurrent ... 2. *T. decurrens*
CC. Outer face of nutlets not entire, with a raised margin ... 3. *T. africanum*
BB. Staminal cone inserted ... 4. *T. sedguickianum*
AA. Fruiting calyx-lobes ovate or rounded at the base :
B. Corolla lobes linear-lanceolate, acumination gradual ... 5. *T. khasianum*
BB. Corolla lobes ovate, acumination abrupt :
C. Throat of corolla with 8-10 gibbose appendages ... 6. *T. calycosum*
CC. Throat of corolla naked ... 7. *T. zeylanicum*

1. **Trichodesma indicum** (Linn.) Lehm. Pl. Asperifol. 193. 1818; Roem. et Schult. Syst. 4: 68. 753. 1819; Wall. Cat. n. 932. 1828, nomen; A. DC. in DC. Prodr. 10: 172. 1846; Wight, Ill. Indian Bot. 2: t. 172. 1841; Boiss. Fl. Orient. 4: 280. 1875; Baker, Fl. Mauritius: 203. 1877; Clarke in Hook. f. Fl. Brit. Ind. 4: 153. 1883; Watt Dic. Econ. Pr. Ind. 6(4): 80. 1893; Prain, Bengal Pl. 2: 720. 1903; Wood in Rec. bot. Surv. Ind. 2: 199. 1903. Cooke, Fl. Pres. Bombay 2: 214. 1904; Prain, Rec. bot. Surv. Ind. 3(2): 242. 1905; Robinson in Philipp. Journ. Sci. 4: 696. 1909; Duthie, Fl. Upp. Gang. Pl. 2: 94. 1911, *pro parte*; Brand in Engl. Pflanzenr. Heft. 78: 38. 1921; Collett, Fl. Siml.: 331. 1921; Haines, Bot. Bihar & Orissa 4: 580. 1922; Gamble, Fl. Pres. Madras 2: 899. 1923; Kazmi in Journ. Arnold Arbor. 52: 516. 1971.

1a. var **indicum.** *Borago indica* Linn. Sp. Pl. ed. 1: 137. 1753; ed. 2: 197. 1762.

Type: Habitat in India Orientali, Herb. No. 188. 2 (LINN., photo!). *Pollichia indica* Medic. Bot. Beob.: 247, 1783. *Borraginoides sagittata* Moench, Method.: 516. 1794. *Borago spinulosa* Roxb. Hort. Bengal: 13. 1814, *nomen.* et in Fl. Ind. 1: 459. 1820; Fl. Ind. ed. Carey & Wall. 2: 11. 1824. *T spinulosum* (Roxb.) Voigt, Hort. Suburb. Calc.: 444. 1845. *T. hirsutum* Edgew. in Journ. Asiat. Soc. Bengal 21: 175. 1853.

A much branched, erect or diffuse, annual, hispid herb, 15-45 cm high. Leaves opposite crowded, sessile, uninervate, lanceolate, linear-lanceolate to ovate-oblong, 2.5-6 cm by 1-1.5 cm, apex obtuse, somewhat attenuate, base subcordate and semi-amplexicaul, margins strongly revolute, clothed above with stiff hairs, often springing from white circular tubercles, more or less densely villous beneath. Flowers white, changing to pale blue or violet, solitary and leaf-opposed and in terminal few flowered cymes, bracts foliaceous, pedicels long, slender, 1-2 cm long, hairy, recurving. Calyx subconiform, up to 1.2 cm long, hispid with long stiff hairs, segments 5, longer than the sinus between the corolla lobes, up to 0.6 cm long, lanceolate, acute to shortly acuminate, cordate or hastate at the base, bases acute, narrow, often spreading, connate by the basal auricles. Corolla up to 1.6 cm long, tube up to 0.8 cm long, as long as the lobes, infundibuliform, thinly hairy inside, lobes 5, ovate, abruptly acuminate, acuminations spirally twisted, with 5 glandular, orange to brownish swellings at the base of the corolla lobes, imbricate. Stamens 5, filaments short, adnate to the corolla tube, anthers bilobed, erect, elongate, lanceolate, connivent in a cone, tips of connectives excurrent and at length spirally twisted, back of connectives densely covered with yellowish-white felted tomentum composed of short, crisped, opaque hairs, glabrous tips of connectives naked; connivent stamens remaining united when the corolla is split open, far exserted beyond the patent limb. Ovary ovoid, 4-lobed, tapering into style, glabrous; style terminal, filiform, stigma small, ovule-sub-horizontal. Fruit pyramidal, sub-4-ridged, nutlets 4.5 mm long, 3 mm broad, with smooth shining backs and scabrous more or less margined inner faces, oblong in outline; embryo 3½-4½ mm long, radicles short, cotyledons ovate.

Flowering: August-December; *Fruiting*: October-January.

Vernacular names: *Hind.* Chhota Kulpha; *Beng.* Choto Kulpa; *Marathi* Lahana-Kalpa; *Tam.* Kalhudaitumbai; *Tel.* Guvvagutti; *Kash.* Ratisurkh.

Specimens examined: INDIA: JAMMU & KASHMIR: Muzaffarabad, Kashmir, June, 1907, *Keshvanand* 679 (DD). HIMACHAL PRADESH: Simla hills, *Griffith* s.n. (CAL); Simla old road, 840 m, *J. S. Gamble* 5723 c (CAL); Katori, 1000 m, Dalhousie, 18.6.1958, *R. Gupta* 11 (DD). PUNJAB: Punjab, *T. Thomson* s.n. (CAL). UTTAR PRADESH: Kheri, Oudh, 10.4.98, *Inayat* 22210 (CAL); Pilibhit, Upp. Gang. Pl. 27.5.98, *Inayat* 22191 (CAL); Gonda, Oudh, 22.5.98, *Harsukh* 22192 (CAL); Bharaich, Oudh, 14.6.98. *Harsukh* 22211 (CAL); Gorakhpur, Upp. Gang. Pl. 7.4.98, *Harsukh* 222193 (CAL); Gonde, Oudh, 17.5.1900, *Inayat* 23742 (CAL); North Oudh, *R. Thomson & Brandis* 140 (CAL); Lucknow, May, 1856, *T Anderson* s.n. (CAL); Bahraich, Oudh, 9.4.1900, *Inayat* 23739 (CAL); Nawal khan, Oudh, *D. Brandis* 1551 (DD); Kheri forest, Nov. 1883, *N. Hearh* s n. (DD); Valleys of the Bhaour, *D. Brandis* 1552 (DD); Mahope, U.P. 24.6.1902, *Inayat* 26105 (DD); Karenpa, Chinde Dt., U.P., 2.1.1890, *J. F. Duthie* 95860 (DD); Bijnor, U.P., 1.9.1959, *K. M. Vaid* s.n. (DD); Barjad, Pilibhit Dt., U.P., 27.5.98, *Inayat* 22191 (DD); Pacham, Lehra, Gorakhpur Dt., U.P., *Harsukh* 22193 (DD); Mussouri, *G. Kind* s.n. (CAL); Dehradun, *G. Kind* s.n. (CAL); Dehradun, Dec., 1896, *P. W. Mackinnon* s.n. (CAL); Nainital, 1650 m, Kumaon, *Strachey & Winterbottom* 253 (CAL); Saharanpur, N. W. P., Nov., 1894, *J. S. Gamble* 23993 (CAL); Shnigori, 1000-1500 m, N. W. P., *Inayat* 20880 (CAL); From Helaspoorto Mardi, gravel and sandstone, 700-1000 m, 5.8.65, *Stolizka* s.n. (CAL); Raneepoocarna, 21.5.1864, *Brandis* 4238 (CAL); Dehradun, 25.7.70, *G. King* s n. (GAL); N. W. Himalaya, near Mussouri, *G. King* 1869 (CAL); Dehradun, U.P. Fls. white, 10.4.55, *K. M. Balapure* s.n. (DD); Pankhal, Tehri Garhwal, 1250 m, fls. bright violet, 3.10.54, *K. C. Sahni* 21591 (DD); Almorah, Kumaon, U.P., *without collector's name* 176 (DD); Kaomari, Kumaon, Nov., 1892, *J. S. Gamble* 23993 (DD); Gurukul, Kangri, Hardwar, common, fls. white, 25.3.1937, *M. B. Raizada* s.n. (DD). Bihar: Motihari, Champaran Dist., corolla with 5 distinct semilunar, glandular orange to brownish swellings at the base of corolla lobes, fls. white in the morning, changing to pale blue or pale mauve in the afternoon. *Banerjee* 191 (CAL); W. Latihar, Palamow, *J. S. Gamble* 8696 (CAL); Jona, Choto Nagpur, *D. Prain* s.n. (CAL); Behar, *C. W. Hope*, Acc. no. 306429 (CAL); Hazaribagh, Choto Nagpur, *J. S. Gamble* 8585 (CAL); Dalmig Sarai, Darbhanga, *Prain's Collector* Acc. no. 306431 (CAL); Ranchi, *Mokim* s.n. (CAL); Burakar, Manbhoom, *C. B. Clarke* 20646 A (CAL); Dorunda, Ranchi, *D. Prain* Acc. no. 306441 (CAL); Pakhuria, 305 m, Manbhoom, *Campbell* s.n. (CALU). West Bengal: Bengal, *J. D. H. & T Th.* s.n. Acc. no. 30442 (CAL); Rajmahal, *Wallich* 932A (CAL); Birbhum, *Mc.Lelland* s.n. (DD); Bengal, *Griffith* s.n. (DD); Cult. in Hort. Bot. Gard., *King* s.n. (DD); Rajapore, Bengal, *S. Kurz* 144 (DD); Caragola, *Collector's name not mentioned* 11741 (CAL). Orissa: Kalamba, 305 m, Ganjam Dist., *J. S. Gamble* 14090 (CAL); Lankera, 2438 m, Jashpore, *C. B. Clarke* 34055 A (CAL); Bagmuda, Angul, Orissa, *J. H. Lace* 2614 (CAL); Kalahandi State, Orissa, *Chakraborty & Banerjee* (CALU); Khandijheran, 300 m, Orissa, *G. Panigrahi* 20910 (CAL). Madhya Pradesh: Gwalior, April, 1889, *C. Maries* 24 (CAL); Godia, C. India, June, 1867, *G. King* 84 (CAL); Dhupgarh, C.P., 20.8.49, *S. K. Jain* s.n. (DD); Dharwar, growing on black soil, 28.2.1885, *W. A. Talbot* 1164 (CAL); Mahadeb hills, Hoshangabad, C.P., 21.8.49, *V. Narayanaswami* 3429 (CAL); Inhal, Sept., 83, *Schlech* s.n. (CAL). Gujarat: Bhuj, Kutch, Dec., 1907, *without collector's name* 21571 (BLAT); Cutch, Dec., 1907, *without collector's name* 21670 (BLAT); Porbandur, 13.5.1952, *H. Santapau* 14275 (BLAT); Dwarka, 22.8.52, *H. Santapau* 14731 (BLAT); Girnar forest, along road, Saurastra, 2.10.53, *H. Santapau* 16157 (BLAT); Janagadh to Sasan, Saurastra, fls. purplish, not blue, abundant, prostrate on sand, 4.10.53, *H. Santapau* 16289 (BLAT); Vazvavel-Junagadh, 28.10.58, *H. Santapau* 15222 (BLAT). Maharashtra: Parol, Bombay, fairly common, *N. Y. Das* 5482 (BLAT); Maladquarry hills, Bombay, 3.12.54, *G. L. Shah* 1147 (BLAT); Kaveri caves, Bombay, fls. blue, 23.1.1942, *H. Santapau* 14121 (BLAT); Khandesh, fls. blue, Dec., 1916, *E. Blatter* 21594 (BLAT); Khandesh, fls. red, Dec. 1916, *E. Blatter* 21598 (BLAT); Panchgoni, Oct., *E. Blatter* 21607 (BLAT); M. S. College premises, Nagpur, *M. Fraser* (BLAT). Andhra Pradesh: Kappakonda, Godavari Dt., 12.8.1914, *M. S. Ramaswami* 1654 (CAL); Velugode, Kurnool, A.P., 16.2.1957, *S. K. Wagh* 4717 (BLAT); Cuddapa, Madras, 2.11.1938, *E. K. Krishnan,* s.n. (DD); Samalkota, Godavari, 30.4.1913, *without collector's name and no.* Acc. no. 80882 (MH). Tamil Nadu: Ramapuram, 700 m, 31.8.1905, *C. E. C. Fischer* 102 (CAL); Iruttupallam, Coimbatore Dt., 22.9.1910, *C. E. C. Fischer* 2192 (CAL); Madras Stn., March, 1870, *C. B. Clarke* 15643 (CAL); Penin. Ind. Or., *Wight* 2069 (CAL), Kaliamba, 335 m, *J. S. Gamble* 14090 (CAL); Trichinapally, 3

Sept., 1878, *G. King* s.n. (CAL); Madras beach, May, 1917, fls. pale lilac, throat brownish, *E. Blatter* 22102 (BLAT); Sadevayal, Madras, fls. white, 6.9.1960, *A. N. Henry* 61 (BLAT); Forest College Estate, Coimbatore, 27.12.63, *K. N. Subramanyam* 570 (DD); Forest College Compound, Coimbatore, 12.1.1951, *S. K. Jain & R. C. Bharadwaja* 22523 (DD); Nungambakam, S. India, Feb., 1899, *without collector's name and no.*, Acc. no. 34194 (MH); Coimbatore, *without collector's name and no.*, Acc. no. 34198 (MH); Central farm, Coimbatore, Feb. 1925, *without collector's name and no.*, Acc. no. 34216 (MH); Hassamer, Coimbatore, 1000 m, fls. bluish, *K. C. Jacob* 202 (MH); Dananampatnam S. Arcot, *V. Narayanaswami* 5120 (MH); Udankudi, Tinnevelly Dt., *K. M. Sebastine* 13705 (MH); Near Suruli falls, 300 m, Madurai Dt., purplish-blue fls., 24.6.1950, *K. Subramanyam* 8193 (MH); Naruthumalai, Coimbatore, 633 m, 16.7.1956, *K. M. Sebastine* 292 (MH). KARNATAKA: Nanjangud, Mysore, 28.3.1905, *C. A. Barber* 6810 (CAL); Bellary Dist., 20.9.1916, *without collector's name and no.*, Acc. no. 34212 (MH); Bangalore, 1918, *R. D. A. B.* 466 (MH); Near St. P. College, Mysore, *K. M. Sebastine* 18719 (MH). KERALA: Malabar, *Stocks* s.n. (CAL); Shencottah to Aryan Kaveri, Aug. 1913, *C. C. Calder & Ramaswami* 756 (CAL); Courtellum, 16.12.1913, *M. Rama Rao* 1859 (CAL). BURMA: Ilp Slay, 9.10.68, *T. Anderson* s.n. (CAL); Kyoukse, Upper Burma, 10.2.1893, *King's Collector* 48 (CAL); Sagaing, fls. purple, 25.3.1893, *King's Collector* 405 (CAL); Minboo, Upper Burma, 10.3.1893, *King's Collector* 289 (CAL); Minboo, Upper Burma, *King's Collector* s.n. (CAL); Upper Burma, Dec. 1890, *Abdul Huk* s.n. (CAL).

Distribution: Throughout India, ascending up to 1000 m on the Himalayas, extending to Sri Lanka, Pakistan, Afghanistan, Iran, Mauritius and Philippines.

Economic importance: Plant diuretic, used as an emollient pultice; leaves, in a cold infusion considered depurative; roots are pounded and made into a paste and applied to reduce swellings, particularly on the joints, also pounded with water and given as a drink to children in dysentery (Chopra *et al.*, 1956).

Notes: The authorship for the combination *T. indicum* based on *Borago indica* Linn. is attributed to Lehman (1818) for it was he who first definitely indicated the combination intended, as required under Article 33 of the Code (Seattle, 1972).

1b. **Trichodesma indicum** var. **amplexicaule** (Roth) Cooke Fl. Pres. Bombay 2: 215, 1904; Sedgwick in Rec. bot. Surv. Ind. 6: 350, t. 11. 1913; Banerjee in Bull. bot. Soc. Bengal 16: 9. 1962; Kazmi in Journ. Arnold Arbor. 52: 518. 1971. *T. amplexicaule* Roth, Nov. Sp. Pl. 104. 1821; Clarke in Hook. f. Fl. Brit. Ind. 4: 153. 1883, *pro parte*; Brand in Engl. Pflanzenr. 78: 39. 1921, *pro parte* non A. DC. "in India Orientali legit". *T. perfoliatum* Wall. Cat. n. 934, 1828, *nomen*: *T. inaequale* Edgew. in Journ. Asiat. Soc. Bengal 21: 175. 1853. *T indicum* sensu Duthie Fl. Upp. Gang. Pl. 2: 94. 1911, *pro parte*.

A much branched erect, annual, grey villous, hispid, herb, 15-45 cm high. Stems erect, more or less tetragonus, lower portion simple, upper portion more or less dichotomously branched, reddish. Leaves opposite, distant, mostly sessile and amplexicaul, 2.5-10 cm by 1-2.5 cm, entire, broadly ovate or oblong, slightly or not at all villous, densely scabrid with stiff hairs arising from white tubercles, glabrous beneath except on the nerves and veins, cordate at the base, unicostate, only the midrib is impressed, entire, obtuse. Flowers pale blue, solitary and leaf-opposed and in terminal few flowered cymes, pedicels long, slender 1-2 cm long. Calyx up to 1.2 cm long, hispid with stiff hairs arising from white tubercles, segments 5, up to 0.6 cm by 0.3 cm, lanceolate, acute, hastate at the base. Corolla up to 1.6 cm long, tube up to 0.8 cm long, limbs oblique, infundibuliform, lobes 5, ovate, abruptly acuminate. Stamens 5, filaments short, on the corolla tube, anthers erect, subulate, exserted, combined into a complete cone, back of connectives densely tomentose with short, crisped, yellowish-white hairs, tips elongate, glabrous, spirally contorted. Ovary ovoid, 4-lobed, style terminal, filiform, long, stigma small, ovules subhorizontal. Fruit pyramidal, sub-4-ridged, nutlets 4, broad, with smooth shining backs.

Flowering: July-October. *Fruiting*: August-November.

Specimens examined: INDIA: BIHAR: Hazaribagh, Choto Nagpur, *C. B. Clarke* 34612 B (CAL); Juspore, Sirgooja, *C. B. Clarke* 34055 A (CAL). MADHYA PRADESH: Khandwa, C.P. 26.8.1949, *S. K. Jain* s.n. Acc. no. 115451 (DD); Sangor, *Tandon* s.n. Acc. no. 306476 (CAL); Chanda Dist., C.P. 2.1.90, *J. F. Duthie* 9586 (CAL); Baster Dist., M.P., 767 m, fls. white with light violet tinge, 20.11.1958, *K. Subramanyam* 7236 (MH); Chauri, C.P., 29.12.51, *P. V. Bole* 99 (BLAT); Pagne, C.P., Sept., 1918, *J. Fernandez* 31687 (BLAT). RAJASTHAN: Chittor palace area, Jodhpur, on sandy soil, 11.10.55, *M. Vaswani* s.n. Acc. no. 118953 (DD); Dhobe Ghat, Mt. Abu, Oct., 1916, *E. Blatter* 21619 (BLAT). GUJARAT: Kutch, Jalandar Bot., fls. blue, in the open, not common, 12.9.60, *N. A. Irani* 5363 (BLAT). MAHARASTRA: Khandala, Sept., 1908, *H. Santapau* 21671 (BLAT); To Kasara, fls. lilac, Oct., 1917, *without collector's name* 22528 (BLAT); National park, Bombay, 7.10.51, *A. R. Randeria* 65 (BLAT); Matunga, Bombay, Aug. 1916, *without collector's name* 17161 (BLAT); on the beach, Bombay, Aug., 1916, *without collector's name* 17159 (BLAT); Versova, Bombay, fls. blue, on sands, Sept., 1917, *E. Blatter* 28788 (BLAT); Maladkandivali Rly. track, 6.8.1955, *G. L. Shah* 7165 (BLAT); Law College hillock, Poona, 7.6.51, *B. A. Razi* 5124 (BLAT); Versova, Bombay, 31.7.41, *H. Santapau* 141.9 H (BLAT). ANDHRA PRADESH: Upper Godavari agency, 11.12.1902, *C. A. Barber* 5322 (MH). BURMA: Upper Burma, fls. white, 22.6.90, *Abdul Huk* s.n. Acc. no. 306482 (CAL).

Distribution: Throughout India; common in the western region, Sri Lanka, Pakistan.

Notes: The question whether *T. indicum* (L.) Lehm. and *T amplexicaule* Roth, are distinct species or otherwise has long remained doubtful. Clarke (1883) regarded them as distinct chiefly by the leaf character. Cooke (1904) treated *T amplexicaule* Roth as a variety of *T. indicum* [*T indicum* var. *amplexicaule* (Roth) Cooke], differing from *T. indicum* (L.) Lehm. in the character of the leaves only. In all other characters they are more or less similar. *T. amplexicaule* sensu A. DC. (1846) is considered a different species from that of Roth (1821). For De Candolle's plant the new name is *T sedgwickianum* Banerjee (1963).

1c. **Trichodesma indicum** var. **subsessilis** Clarke in Hook. f. Fl. Brit. Ind. 4: 153. 1883. Brand in Engl. Pflanzenr., 78: 39. 1921. *T. subsessilis* Wall. Cat. n. 933. 1828, *nomen*. Type: Prome, Wallich 933. Isotype in CAL!

Laxly branched, erect, white-dotted, hispid, 20-50 cm high shrub. Leaves more or less opposite decussate 3-9 cm by 1-2.5 cm, sub-elliptic, ovate oblong to more or less lanceolate, scabrid, stiff hairs arising from white tubercles, uniformly to specially on the nerves, obtuse, margin more or less revolute, base sub-cordate to more or less attenuated into a short, up to 5 mm long petiole. Flowers infundibuliform, 1-1.5 cm in diam., leaf-opposed and in terminal few flowered cyme; pedicels up to 2 cm long hispid. Sepals 5, 0.6-1 cm long, hastate at the base, attenuated above, densely villous or with fewer hispid hairs. Petals 5, ovate below, abruptly acuminate and spirally twisted above. Stamens 5, up to 0.6 cm long, filaments short, on the corolla tube, anthers combined into a complete cone, back of connectives densely tomentose, tips elongate, glabrous, spirally twisted. Ovary 4-lobed; style terminal, filiform. Fruit pyramidal, nutlets 4, up to 4 mm in diam., smooth shining back.

Flowering and *fruiting*: July-October, often extending throughout the year.

Specimens examined: INDIA: JAMMU & KASHMIR: Muzaffarabad, 986 m, Kishenganga Valley, Kashmir, June, 1907, *Keshavanand* 697 (DD). UTTAR PRADESH: Bahraich, Oudh, Upp. Gang. Pl. 10.4.1900, *Inayat* 23740 (CAL). BIHAR: Ranchi, Sept. 7, 1896, *Mokim* s.n. Acc. no. 306468 (CAL); W. Latihar Palamow, Choto Nagpur, Dec., 1880, *J. S. Gamble* 8696 (CAL). MADHYA PRADESH: Dhupgarh, Hoshangabad, C. P., 20.8.49, *V. Narayanaswami* 23740 (CAL). BURMA: Prome, Burma, Nov., 1826, *Wallich* 933, *Isotype* (CAL); Sampanego, left bank of Irrawaddy, Ruby mines, 5.7.1911, *J. H. Lace* 5309 (CAL); Pegu, Burma, 6th March, *S. Kurz* 2351 (CAL).

Distribution: From Burma to different parts of North India, extending up to Jammu and Kashmir.

Notes: This is a variety intermediate between *T. indicum* var. *indicum* and *T indicum* var. *amplexicaule*, readily distinguished by its sub-elliptic to more or less lanceolate uniformly white dotted leaves with lamina base attenuated into a short petiole.

2. **Trichodesma decurrens** Banerjee in Indian For. 92(1): 56, t. 1. 1966.

Type: Burma, *S. Mokim* 1112 A (CAL).

Erect much-branched hispid herb. Leaves simple, opposite-decussate, sessile, decurrent, lamina broadly linear, up to 5 cm long and 0.6 cm broad, uninervate, attenuate, obtuse, margins strongly revolute, upper surface covered with hispid, bulbous-based, up to 2.5 mm long white hairs, under surface tomentose, covered with shorter, denser mat of white hairs. Flowers white, 1-1.5 cm long, 1-1.2 cm broad, in terminal, few-flowered, hispid, lax, unilateral cymes. Calyx 1-1.3 cm long, up to 0.6 cm broad, sagittate, divided up to two-third of its length, ribbed, densely hispid, hairs up to 0.5 cm long, white, those on the ribs and margins are bulbous-based; segments 5, triangular acute, ciliate, thickish, persistent. Corolla infundibuliform, 1-1.5 cm long, tubular below, tube 0.5-0.6 cm long, lobes 5, 0.5-0.9 cm long, twisted, orbicular, abruptly slenderly apiculate, acumen spirally twisted. Stamens 5, subsessile, attached to the middle of the corolla-tube, closely connivent, cone large and pointed, clothed on the back with dense, crisp, white hairs; anthers elongate lanceolate, up to 8 mm long including connectives, connectives prolonged, linear, spirally twisted together. Ovary ovoid, glabrous, tapering into the style; style 0.8 cm long, slender, stigma small, capitate. Fruit pyramidal, subtruncate at apex, tipped with the persistent style, nutlets 4, up to 5 mm long, ovoid, outer face smooth convex and polished white, inner face rugose, at first closely adnate to the carpophore, finally separating, leaving deep ovate pits on the axis when falling.

Flowering and *fruiting*: January to March.

Specimens examined: BURMA: Zeaing, Burma, *Shaik-Mokim* 1112A *Holotype* (CAL).

Distribution: Burma.

3. **Trichodesma africanum** (Linn.) Lehm. Pl. Fam. Asperifol: 195. 1818; Roem. et Schult. Syst. 4: 69. 753, 1819; Drege in Linnaea 20: 197. 1847; A. DC. in DC. Prodr. 10: 173. 1846; A. Rich. Tent. Fl. Abyssin. 2: 92. 1851; Ascherson-Schweinf. Illustr. Fl. Egypt: 111. 1877; Boiss. Fl. Orient. 4: 280. 1879; Clarke in Hook. f. Fl. Brit. Ind. 4: 154. 1883; Deflers. Voy. Yemen: 173. 1889; Watt Dic. Econ. Pr. Ind. 6(4):

80. 1893; Post, Fl. Syria: 535. 1896; Woodr. in Journ. Bombay Nat. Hist. Soc. 12: 170. 1896; Wright in Th.-Dyer, Fl. Capens, 4(2): 11. 1904; Cooke, Fl. Pres. Bombay 2: 215. 1904; Baker et Wright in Th.-Dyer, Fl. Trop. Africa 4(2): 4. 1905; Muschler, Man. Fl. Egypt.: 788. 1912; Brand in Engl. Pflanzenr. 78: 29. 1921; Kazmi in Journ. Arnold Arbor. 52: 519. 1971. *Borago africana* Linn. Sp. Pl.: 138. 1753; Burm. Prodr. Fl. Cap.: 4. 1768; Thunb. Fl. Cap. ed. Schult: 161. 1823—"Habitat in Aethiopia". *Borago verrucosa* Forsk. Fl. Aegypt-Arab.: 41. 1775. *Pollichia africana* Medic. Bot. Beob.: 247. 1783. *Borraginoides aculeata* Moench, Method.: 516. 1794. *Boraginella africana* O. Ktze Rev. Gen. Pl. 2: 435. 1891. *Borraginoides africana* Hiern, Cat. Afric. Pl. Welwitch. 3: 721. 1898.

An annual or biannual simple or branched, 20-170 cm high herb clothed with scattered rigid white bulbous-based hairs. Leaves opposite or alternate, ovate or ovate-oblong, 1.5-17 by 0.5-7 cm, acute, clothed like the stem with scattered bulbous based more or less pilose hairs, lamina base acute, sessile or attenuated into a more or less 2.5 cm long petiole in the lower leaves. Flowers in many flowered panicles, terminal or axillary; pedicels up to 1.5 cm filiform, densely clothed with hispid hairs. Calyx clothed with stiff white hairs, truncate at the base, deeply lobed, lobes 5-6 mm long with prolonged acute apex, midrib prominent. Corolla light blue, tube shorter than the calyx, lobes triangular ovate, twice as long as the tube, attenuate at apex. Cone of anthers about 6 mm long, pubescent on the back, connectives of anthers twisted at the apex. Style shorter than the calyx; ovary ovoid. Nutlets ovoid, 2-5 mm long, rugose on the inner, smooth on the outer face, with a raised white spiny margin on the inner edge.

Flowering and *fruiting*: August-October,

Vernacular names: Sind.—Paburpani (Watt, l.c.); Baluch.—Charma-ing; Marathi—Paburpanee.

Specimens examined: PAKISTAN: Chandracot, *Edgeworth* s.n. Acc. no. 306485 (CAL); Kharan, Quetta, Baluchistan, 27th Sept., 1904, *R. Hughes* 23229 (CAL); Near Peshawar, March, 1893, *H. Collett* s.n. Acc. no. 306486 (CAL).

Distribution: Africa, Arabia, Afghanistan, Iran, Pakistan to India.

Economic importance: The leaves are used as a diuretic (Watt, l.c.), and also used as a drug for coughs. Sheep fodder.

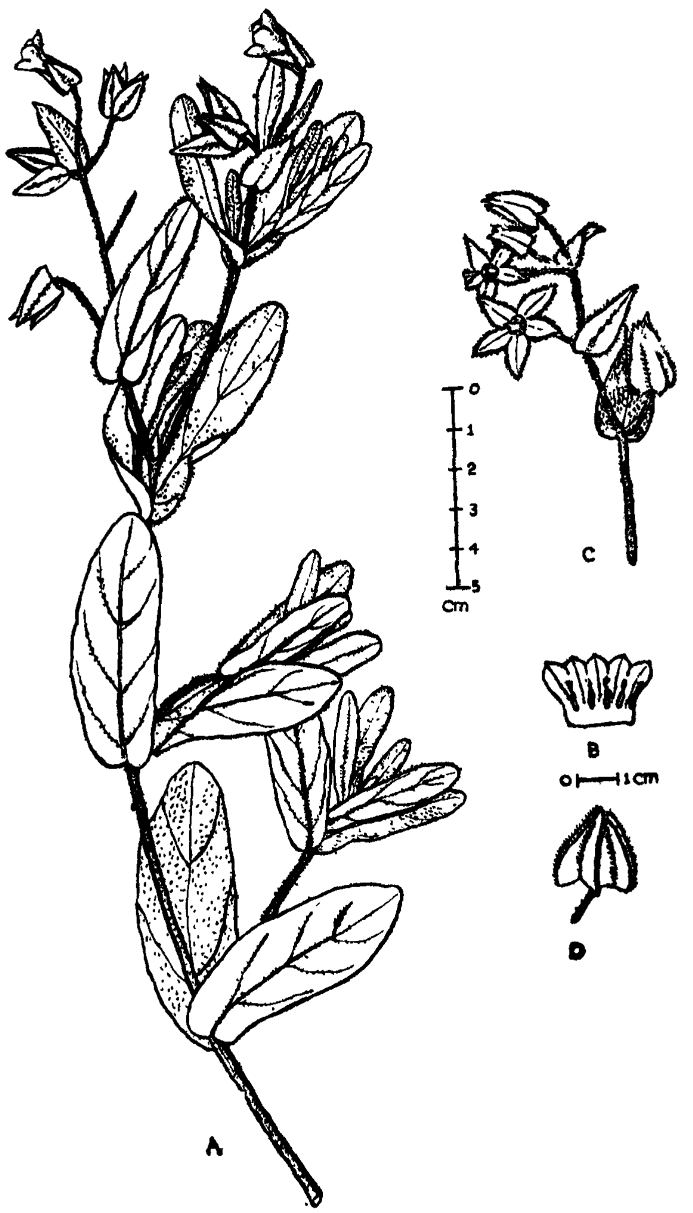
Notes: *T africanum* is distinguished from the other species of our area by its stems and leaves densely covered with prickly, stiff, thick hairs with large calcarious tuberculate bases and crenate, dorsally tuberculate, margined nutlets. However, the occurrence of this plant in India is yet to be confirmed. Clarke (1883), Cooke (1904), Kazmi (1971) reported it from Sind and Punjab in general distribution. But the materials quoted are from present Pakistan although its extension of distribution in Indian side of Punjab and in adjoining Rajasthan is reasonable. We could not trace any collection from India. Our description is based on materials from Pakistan.

4. **Trichodesma sedgwickianum** Banerjee in Bull. bot. Soc. Bengal 16: 10. 1962 (1964); Santapau, Fl. Khandala 3rd ed.: 165. 1967—"in India Orientali Circa Bombay, *Pol. Roux*." *T. amplexicaule* A. DC. in DC. Prodr. 10: 172. 1846; Dalz. & Gibs. in Bombay Fl.: 173. 1861; Clarke in Fl. Brit. Ind. 4: 158. 1883, *p.p.*; Sedgw. in Rec. bot. Surv. Ind. 6: 347. 1913; Brand in Pflanzenr. 78: 39. 1921, *p.p.*; Gamble in Fl. Pres. Madras 2: 899. 1923, *p.p.*—non Roth, 1821; *T. indicum* var. *amplexicaule* Cooke in Fl. Pres. Bombay 2: 215. 1904, *p. p*.

An erect herb, 30-60 cm, branched above. Leaves simple, opposite, sessile, base cordate, sub-amplexicaul, ovate-oblong, entire, obtuse, scabrid (especially beneath) with distinct stiff hairs arising from prominent bulbous bases, reticulate unicostate, the midrib only impressed, 2·5-8 × 1·2-2·5 cm. Flowers solitary and leaf-opposed and in terminal few-flowered cymes, pedicels 2·5-4 cm, hirsute. Flowering calyx up to 1·3 cm long, ovate in outline, deeply divided into 5 lobes shorter than the sinus between the corolla lobes, calyx bases broad, obtuse-auriculate, obliquely truncate below, never spreading, strigose. Corolla gamopetalous, slightly irregular, 5 lobed, the three dorsal segments slightly smaller than the two ventral ones, pinkish lilac, with two prominent reddish-brown marks, representing a glandular thickening of the corolla, at the base of three dorsal lobes; lobes short, mucronulate, limb always sub-erect, contorted, dextrorse, incipient corolla-lobes broad, obtuse, plicate. Stamens 5, epipetalous, merely connivent, but not combined, separating at once when the corolla is split open, always included within the corolla throat; anthers oblong, connectives produced into short ligules, which may be very slightly bent at the tip but not twisted together, back of connectives densely penicillate with straight, erect, white, opaque hairs, which equal or exceed the tips of the connectives. Ovary ovoid, 4 lobed, tapering into the style, glabrous, style terminal, filiform, stigma small. Fruit of 4 nutlets, nutlets smooth, up to 0·8 cm broad, ovoid in outline.

Flowering and *fruiting*: July-October.

Vernacular name: Hind.—Chota-Kalpa.



Trichodesma sedgwickianum Banerjee
Figs. A-D : A. Flowering twig. B. Corolla split open. C. Fruiting twig. D. Fruiting calyx.

Specimens examined: INDIA: MADHYA PRADESH: Blanotank, Khandwa, C.P., *V. Narayanaswami* 3683 (CAL); Gwalior, Aug., 1889, *C. Maries* 78 (CAL). RAJASTHAN: Mt. Abu, 1200 m, Fls. pinkish, 28.9.1963, *M. B. Raizada* 20581 (DD); Mt. Abu Oct., 1866, *E. Blatter* 21695 (BLAT); Mumbra, found along the railway lines, *K. V. Shetty* 209 (BLAT). GUJARAT: Sunda, Dangs, common undergrowth along hedges near Burgada river bank, *G. L. Shah* 10722 (BLAT); Waghai, Rest house hill, Dangs, Fls. pinkish white, occasional on sides of the path, 1.9.1954, *H. Santapau* 19055 (BLAT). MAHARASHTRA: Poona, 12 Sept., 1878, *G. King* s.n. Acc. no. 306464 (CAL); Poona, *N. B. R.* s.n. (DD); Hospet, July 1901, *without collector's name and no.* Acc. no. 34235 (MH); Junnapatti, Matheran, fls. lilac, common along road side, 19.8.1960, *N. A. Irani* 5111 (BLAT); Panchghani, Oct., not very common. *E. Blatter* 21665 (BLAT); Tungar, common, 9.10.1960 *N. Y.*

Das 2333 (BLAT); Matheran, Bombay, fls. pale blue, common on road side, 18.8.1959, *B. Balamani* 280 (BLAT); Shivanrsai, Bombay, 16.8.1959, *N. Y. Das* 264 (BLAT); Parol, Bombay, 5.9.1959, *N. Y. Das* 516 (BLAT); Bombay, fls. pink, Nov., 1916, *without collector's name* 14398 (BLAT); Khandala, 29.8.1960, *C. Saldanha* 5735 (BLAT). Tamil Nadu: Arepalay, Coimbatore, 788 m, 3.7.1930, *V. Narayanaswami*, 3362 (MH). Karnataka: Dharwar, 1.8.1888, *W. A. Talbot* 1665 (CAL); without locality, *Vicary*, Acc. no. 306459 (CAL); Tarikere, Mysore, 658 m, Oct., 1908, *A. Meebold* 6755 (CAL); Dharwar, 757 m, Rainfall 34 inch, common in monsoon, *L. J. Sedgwick & T. R. D. Bell* 6182 (CAL); Tedas, Dharwar dist., 600 m, rainfall 35 inch, trailing over the bank of nullah, May, 1919, *L. J. Sedgwick & T R. D. Bell* 3495 (CAL). Kerala: Malabar, Concan, *Stocks & Law* s.n. Acc. no. 306463 (CAL).

Distribution: Common throughout Peninsular India.

Illustration: Plate I, figs. A-D.

5. **Trichodesma khasianum** Clarke in Fl. Brit. Ind. 4: 154. 1883; Matsumura et Hayata in Journ. Coll. Sci. Tokyo 22: 258. 1906; Dunn in Journ. Linn. Soc. Bot. 39: 502. 1911; Brand in Engl. Pflanzenr., 78; 32. 1921; Kanj. *et al.* Fl. Assam 3: 338. 1939.—Type: Khasia, *Griffith*, Kew Distrib. n. 5989; Isotype in Herb. CAL!

A stout, sparingly setose shrub, 2.5-3.5 m high. Stem stout, younger parts somewhat fleshy, lower woody, cylindrical, glabrous-younger parts sparsely minutely grey hairy. Leaves entire acute, mostly opposite, petiolate, up to 20 × 5.5 cm, elliptic-oblong, narrowed at both ends, scabrous tuberculate above, subglabrate, sparsely hairy beneath. Flowers in many flowered terminal corymbose racemes 5 or 4 merous. Calyx gamosepalous, rusty-pubescent, up to 1·6 cm long, deeply 4-lobed, lobes lanceolate, entire, acuminate, rusty-pubescent, up to 1 cm more than half the calyx tube, accrescent, fruiting calyx up to 2.5 × 1.5 cm, papery. Corolla gamopetalous, up to 1.6 cm long, almost equal in length to the flowering calyx, lobes 4, linear-lanceolate. Stamens 4, filaments short, in the corolla tube, anthers elongate, bilobed, lanceolate, free, loosely connivent in a cone, connective sparsely hairy on the back, tips excurrent, at length twisted. Ovary 4-celled; style terminal, slender, stigma small. Fruit ellipsoid, sub-4-ridged; nutlets 4, 0.5 cm long, widely margined.

Flowering: November-February; *Fruiting*: January-March.

Specimens examined: INDIA: Arunachal Pradesh: Mishmi, Assam, *Pouce* s. n. (CAL); Mishmi Hills, *Coll. name not mentioned* s.n. (CAL); Serpo valley near Rengging, 510-580 m, Fl., Abor Expedition, *I. H. Burkill* 36629 (CAL); Douliang to Jamling, 617-683 m, Lohit F. D., N. E. F. A., *Rolla S. Rao* 10781 (ASSAM) & (CAL). Assam: Assam, *G. Mann* s.n. (CAL). Nagaland: Kohima, 1525 m, *A. Meebold* 5155 (CAL); Kohima, Naga Hills, *R. N. Dey* 17455 & 19715 (ASSAM); Naga Hills, Assam, *N. L. Bor*, 20829 (ASSAM); Naga Hills, Assam, *C. B. Clarke* 41828 A (CAL); Naga Hills, Assam, *N. L. Bor* 2820 (DD). Mizoram: Lushai Hills, Mrs. Parry 12 (CAL). Manipur: Kujera, Manipur, 2128 m, *George Watt* 5894 (CAL); Kungpi, Manipur State, 1783 m, a shrub with brownish 4-merous fls., *N. L. Bor* 93 (DD). Meghalaya: East Bengal? (Khasia), *Griffith*, Kew Distrib. n. 5989 *Isotype* (CAL); Khasia Hills, *S. Kurz* s.n. (CAL); Khasia Hills, *Coll. of Bot. Gard. Calcutta* s.n. (CAL); Khasia Hills, *Coll. name not mentioned* s.n. (CAL); Khasia Hills, *Coll. of. Bot. Gard. Calcutta* s.n. (DD); Khasia Hills, *S. Kurz* s.n. (DD). BURMA: Upper Chindwin, 1074 m, 26.4.1915, *I. M. D. U.* (CAL); Webula, Falam, damp ravines, on slopes at 1304 m, plant

8-10 ft., 29.4.1938, *F. G. Dickson* 7347 (CAL).

Distribution: North West Malayasia and from Eastern India to East Asiatic countries.

6. **Trichodesma calycosum** Collett et Hemsl. Journ. Linn. Soc. (Bot.) 28: 92. 1890; W. W. Smith in Rec. bot. Surv. India 4: 270. 1911; Lacaita, Journ. Linn. Soc. (Bot.) 43; 476. 1916; Johnston, Journ. Arnold Arbor. 33: 75. 1952—Type: Burma, "Shan hills at 4000 feet" *Collett*. *Lacaitaea calycosa* (Coll. & Hemsl.) Brand in Fedde, Repert. 13: 81. 1914 and in Engl. Pflanzenr. 78: 44. 1921. *Trichodesma hemsleyana* Levl. in Fedde, Repert. 9: 327. 1911 and Fl. Kouy Tcheou 55. 1814; Brand in Engl. Pflanzenr. 78: 43. 1921. *T sinicum* Brand in Fedde, Repert. 12: 504. 1913 and in Pflanzenr. 78: 43. 1921. *T. calcareum* Craib, Kew Bull. 1914: 8. 1914. *T. khasianum* var. *calcareum* (Craib) Brand in Engl. Pflanzenr. 78: 33. 1921. *Octosomatium kerrii* Gagnep. Not. Syst. 14: 23. 1950.

Erect, softly hirsute stout herbs, 1-6 m tall. Stem erect, robust, tetragonous, hirsute, with brown hairs. Leaves entire, apex acute or slightly acuminate, lamina base narrowed to the petiole, densely greyish tomentose, velutinous, subsessile, opposite, or upper alternate; basal leaves oblong-elliptic, up to 42 cm long, 16.5 cm broad; upper cauline leaves smaller, up to 16 cm long, lanceolate. Flowers usually pentamerous but occasionally tetramerous in much branched, laxly paniculate terminal inflorescence, open flowers 1 × 1 cm; pedicels up to 1.5 cm long, longer than the calyx, densely greyish tomentose. Calyx gamosepalous up to 1.3 cm long, softly strigose or grey-tomentose outside, glabrate inside, lobes 5, twisted, ovate lanceolate, acute, lobes up to 6 mm long, accrescent calyx leafy, ovate-acuminate, 2 × 2.5 cm in fruit. Corolla gamopetalous, yellowish-brown, up to 1.5 cm long, equal or slightly larger than the calyx, campanulate, tube broad, up to 8 mm long and 6 mm broad; throat of corolla with 8-10 gibbose appendages, 2 appendages opposite each corolla lobe, each appendage 1 mm broad at base and 1.5 mm long. Stamens 5, laxly connate, anthers bilobed, subsessile, oblong-linear, densely villous with white hairs at the back of the connectives, anthers aristate, elongated portion of the connective as long as the anther lobes, and apex of elongated connectives, spirally twisted. Style glabrous, slender, up to 1 cm long, stigma capitate. Fruit ellipsoid, of 4 nutlets, often less or 1 or 2 nutlets poorly developed or immature, glabrous, interior face convex or cup-shaped, denticulate or sub denticulate-marginate, slightly incurved, 6 mm. in diameter.

Flowering and *fruiting*: January-April.

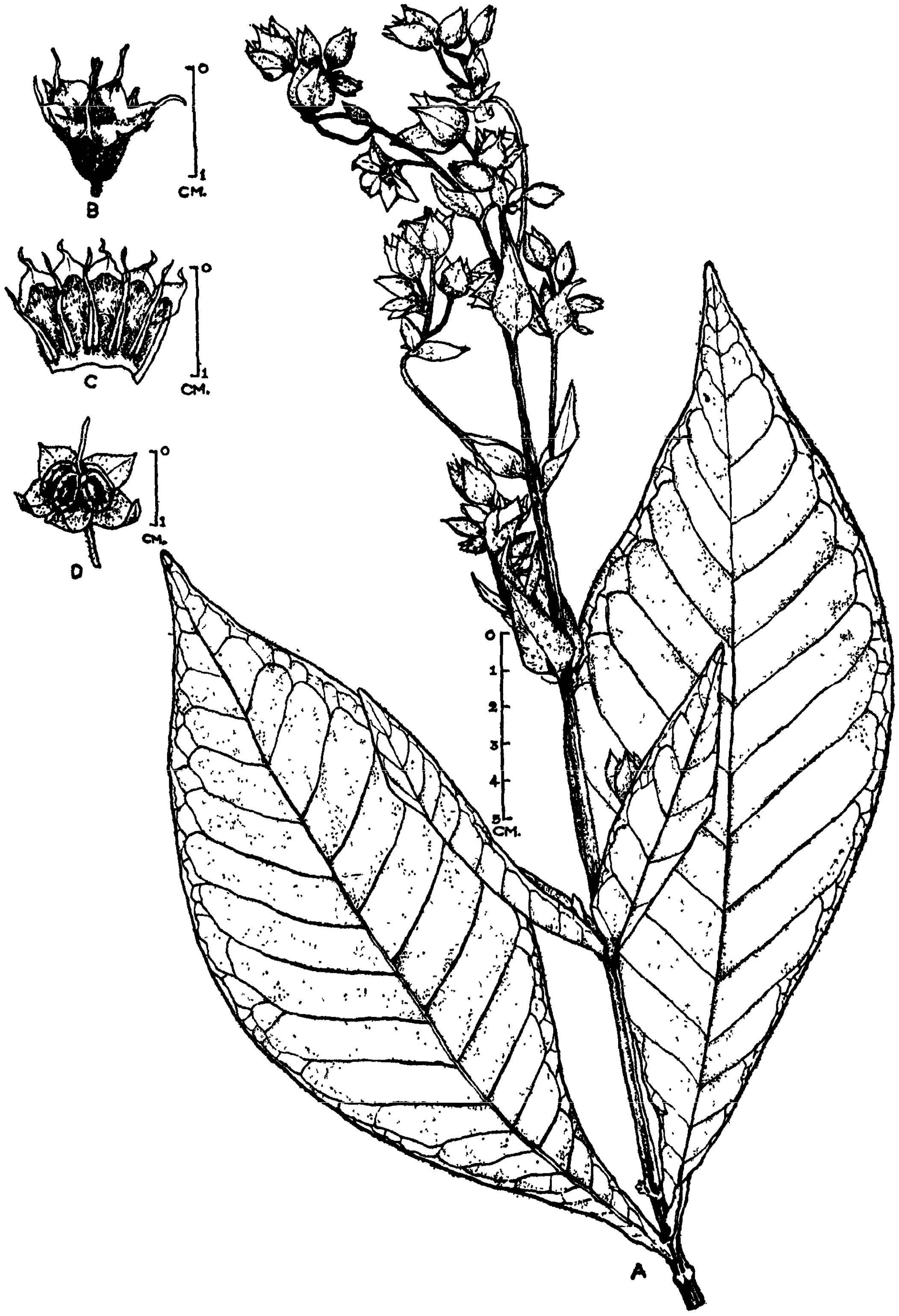
Specimens examined: INDIA: SIKKIM: Labdah, 1000 m, Sikkim, *Ribu & Rhomoo* 3535 (CAL); Geeural, Sikkim, 360 m, *Kari* 526 (CAL); Jhaupat, Sikkim Himalaya, *G. A. Gammie* s. n. (CAL); Mungpoo, Sikkim, *G. H. Cave* 53 (CAL); Riang, near Mungpoo, Sikkim, *Kari* 720 (CAL) & (DD). BHUTAN: Dumsong, Bhutan, 1812 m, *J. S. Gamble* 7544 (CAL) & (DD). BURMA: Without precise locality, Mimbu, *Mokim* s. n. (CAL).

Distribution: Eastern Himalayas, Burma, from China to Northern Thailand and adjoining Cambodia and Vietnam.

Notes: This species was first reported from Eastern Himalayas by W. W. Smith (1911). It was collected much earlier, even before its original description by Collett & Hemsley (1890), from Bhutan by J. S. Gamble in 1879 and from Sikkim by G. A. Gammie in 1886.

T calycosum shows remarkable similarity to *T. khasianum* except that the latter species has absolutely no faucal appendages and should belong together in one and the same genus. To dissociate them generically on the basis of one character seems unnatural (Johnston, *l.c.*).

Illustration: Figs. A-D.



Trichodesma calycosum Coll. & Hemsl
Figs. A-D : A. Flowering twig. B. Flower. C. Corolla split open. D. Fruit.

7. **Trichodesma zeylanicum** (Burm.) R. Br. Prodr. Fl. Nov. Holland 496. 1810; Lehm. Asperifol. n. 149. 1818; Roem. et Schult. Syst. 4: 69. 753. 1819; Wall. Cat. n. 935. 1828, *nomen* ; A. DC. in DC. Prodr. 10: 172. 1846 ; A. Rich. Tent. Fl. Abyss. 2: 91. 1851 ; Hook. Bot. Magaz. 80: t. 4820. 1854 ; Schweing. Beitr. Fl. Aethiop.

117. 1867; Benth. Fl. Austral. 4: 404. 1869; Baker, Fl. Mauritius 202. 1877; Clarke in Hook. f. Fl. Brit. Ind. 4: 154. 1883; Engl. Hochgebirgsfl. Trop. Africa 352. 1892; Gurke in Engl. et Prantl. Pflanzenfam. IV 3a: 99, f. 40 D. 1893; Watt Dic. Econ. Pr. Ind. 6(4): 80. 1893; Prain, Bengal Pl. 2: 720. 1903; Cooke, Fl. Pres. Bombay 2: 215. 1904; Prain, Rec. bot. Surv. Ind. 3(2): 243. 1905; Robinson in Philip. Journ. Sc. 4: 696. 1909; Duthie, Fl. Upp. Gang. Pl. 2: 94. 1911; Brand in Engl. Pflanzenr. 78: 40. 1921; Haines Bot. Bihar and Orissa 4: 580. 1922; Gamble, Fl. Pres. Madras 2: 899. 1923; Mooney, Suppl. Bot. Bihar and Orissa 90. 1950. *Borago zeylanica* Burm. Fl. Ind. 41, t. 14, f. 2. 1768; Linn. Mant. 202. 1717; Jacq. Collect. bot. 2: 169. 1789 and Ic. Pl. Rar. 2: t. 314. 1786-1793; Roxb. Fl. Ind. ed Carrey & Wall. 2: 10. 1824.—"Habitat in Zeylona". *T. zeylanicum* (Burm.) R. Br. subsp. *eu-zeylanicum* Brand var. *vulgare* Brand forma *typicum* (*zeylanicum*) Brand in Engl. Pflanzenr. 78: 41. 1921. *T. zeylanicum* (Burm.) R. Br. subsp. *eu-zeylanicum* Brand var. *vulgare* Brand forma *longifolium* Brand *l.c.* 42. *Borago indica* Blanco, Fl. Filip. ed. 1, 81. 1837, non Linn. 1753. *Leiocarya kotschyana* Hochst. in Flora 27: 30. 1844; *T. kotschyanum* Fenzel. in Plant. Kostschy. ex A. DC. *l.c.* *Pollichia zeylanica* F. v. Muell. Syst. census Austrl. Pl. 100. 1882. *Boraginella zeylanica* O. Kutze. Rev. Gen. Pl. 2: 435. 1891.

A large erect annual herb, 30-60 cm with stout, often purplish stems, clothed with long soft hairs; more hairy towards the inflorescence. Leaves 2.5-12 cm by 1-3.5 cm, opposite, oblong or oblong-lanceolate, sub-acute or obtuse, densely clothed above with soft stiff hairs arising from bulbous, white bases, finely pubescent and with a few pustular hairs beneath, base usually narrowed; petioles 0.5-1 cm long, slender, often obscure or almost sessile. Flowers pale blue, usually in terminal elongate bracteate, paniculate cymes or occasionally a few solitary flowers in the upper leaf axils; pedicels 0.5-1.5 cm long slender, cylindrical, hairy, nodding, bracts foliaceous. Calyx with 5, lanceolate or ovate-lanceolate, lobes often overtopping the corolla, divided almost to the base, clothed with soft appressed hairs, rounded at the base, calyx up to 1.7 cm long, segments up to 1 cm. Corolla up to 1 cm long, campanulate, lobes 5, short, broad or obovate-rounded, plicate, with a sudden spirally twisted accumination. Stamens 5, on the corolla tube, filaments short, anthers lanceolate, connivent in a cone, connectives more or less hairy on the back, excurrent, at length twisted. Ovary 4-celled, ovoid, glabrous; style short, slender, glabrous, terminal; stigma minute. Nutlets broadly ovoid, sub-obtuse, finely margined, the inner face slightly rugose, covered by spreading, leafy, ovate-lanceolate, acute, accrescent calyx, appressed hairy and divided almost up to the base.

Flowering and *fruiting*: January to March, often extending throughout the year.

Vernacular names: Hind.—Hetemuria; Marathi—Jalashirasi; Sans.—Jhingi.

Specimens examined: INDIA: BIHAR: Wasteground, Singbhum, *H. H. Haines* 592 (CAL); Chutia Nagpore, *J. J. Wood* 1903 (CAL). W. BENGAL: Bengal, *J.D.H. & T.Th.* s.n. Acc. no. 306511 (CAL); Midnapore, *Garden Collector* s.n. Acc. no. 306512 (CAL); Manbhum Dist., *S. Kurz* s.n. Acc. no. 306513 (CAL). MADHYA PRADESH: Jubbulpore, 13.3.28, *R. S. Hole* s. n. Acc. no. 30643 (DD); Bulanpura, Chand Dist., *J. F. Duthie* 9585 (DD); Jubbulpore, C.P., Jan., 1903, *R. S. Hole* 188 (CAL); Jarak Chand, 12.1.58, *Sethi & Negi* 26212 (DD); Bichhia, Mandla Dist., 7.2.61, *J. Joseph* 12237 (MH). GUJARAT: Broach, opposite bank of river, 6.5.1955, *G. L. Shah* s.n. (BLAT); Unai, Dangs forest, abundant in some fields near river, not seen elsewhere, 8.3.54, *H. Santapau* 18207 (BLAT); Baroda, 29.12.1954, *G. L. Shah* 1366 (BLAT); Kihar, Tapti river, fls. lilac with 5-pinkish spots, Dec., 1918, *E. Blatter* 26960 (BLAT); Surat, Tapti river, Dec., 1918, *E. Blatter* 26994 (BLAT); Shapur, Saurashtra, 28.10.52, *H. Santapau* 15220 (BLAT). MAHARASHTRA: Kamthi Road, Nagpur, Dec. 24. 1959, *M. Firdoshi* 604 (BLAT). ANDHRA PRADESH: Herslejkonda, Cuddapah, July, 1884, *J. S. Gamble* 15137 (CAL); Settikunta, 300 m, Cuddapah Dist., Feb., 1883, *J. S. Gamble* 11006 (CAL); Tummileru, Godavari Dist., 10.12.1902, *without Collector's name* 5285 (CAL); Hyderabad, Deccan, 6-8 ft. tall, fls. bluish lilac, gregarious, near dam, 5.1.54, *H. Santapau* 18014 (BLAT); Udayagiri, Nellore, 31.7.57 *S. K. Wagh* 6735 (BLAT); Cuddapah, Madras, 28.11.38, *K. R. Krishnan* 877 (DD); Nagarjunsagàr, Nalconda Dist., A.P., 100 m, fls. violet, *K. M. Sebastine* 9724 (MH); Tumimileru, Godavạri agency, 10.12.1902, *C. A. Barber* 5285 (MH); Kurnool Dist., Andhra State, 8.2.1963, *J. L. Ellis* 18022 (MH); Diguramatta, Kurnool Dist., 28.12.1906, *C. A. Barber* 8003 (MH & CAL). TAMIL NADU: Kambaur, Madras Dist., May, 1917, *Blatter & Hallberg* 365 (CAL); Arcot, May, 1883, *without collector's name and no.* Acc. no. 306498 (CAL); Coimbatore, *without collector's name and no.* Acc. no. 306499 (CAL); Coonur Ghat, 800 m, Nilghiris, 7.3.1870, *C. B. Clarke* 10480 B (CAL); Penin. Ind. Or. *Wight* 2071 (CAL); Maliyamadengam, 1300 m, 11.9.05, *C. E. C. Fischer* 378 (CAL); Tamacakarai, 1150 m, 7.8.1905, *C. E. C. Fischer* 130 (CAL); Sirumalai, Madura Dist., 12.5.58, *T Pathanam* 3192 (BLAT); Sirumalai, Madura Dist., April, '55, *T Pathanam* 135 (BLAT); Top Slip Koraier, South India, *K. N. Vaid* 23308 (DD); Attakatti, Coimbatore Dist., Madras state, 780 m, *J. Joseph* 13289 (MH); Talivadi, 822 m, Coimbatore Dist., 6.3.1931, *K. C. Jacob* 63 (MH); Kilurpatti, 658 m, Coimbatore Dist., *S. R. Raju* 4849 (MH); Ponnachi, Coimbatore Dist., 102 m, 7.2.1930, *V. Narayanaswami* 19612 (MH); Chandagiri, N. Arcot, 25.2.1914, *without collector's name and no.* Acc. no. 10036 (MH); Kondapalli fort, Kistna, 1.10.1902. *C. A. Barber* 4591 (MH); Srịanikulam, 9.9.1899, *C. A. Barber* 871 (MH); Mundanthusai, Tinnevally Dist., 17.9.15, *without collector's name and no.* Acc. no. 34250 (MH); Rajkota, Salem Dist., 29.12.1913, *without collector's name and no.* Acc. no. 34249 (MH). KARNATAKA: Mysore and Carnatic, *G. Thomson* s. n. (CAL); Halebid, Mysore, 658-750 m, *A. Meebold* 6754 (CAL); Sidashyagud, N. Kanara, 28.1.1806, *W. A. Talbot* 1356 (CAL); Fraserpet, Coorg, 14.12.95, *A. E. Lowrie* 120; Bangalore, 5.9.1878, *G. King* s. n. (CAL). KERALA: Walaya, Malabar Dist., 290 m, 6.1.1911, *C. E. C. Fischer* 2442 (CAL); Vadakancheri, Malabar Dist., 28.12.1919, *without collector's name and no.* Acc. no. 34252 (MH).

Distribution: From the Eastern Tropical Africa through Indian Subcontinent, Indonesia and the Philippines up to Australia.

Economic importance: Emolient poultices are made from the leaves (Watt, 1893).

Notes: This species, as R. Brown (1818) says, is a polymorphous plant especially in the amount of coarse hairs and pubescence. Differences are also observed in the measurement of leaves or in the nature of inflorescence. Flowers are arranged either in elongate multiflowered paniculate cymes or in a cluster of a few terminal flowers on short axis. But both types of arrangement of flowers are sometimes observed in the same plant. We think, a single variable taxon is represented and it does not warrant erection of new formae, which might lead to confusion.

ACKNOWLEDGEMENTS

The authors are grateful to the Director, Botanical Survey of India and to Dr. R. S.

Rao, former Deputy Director, Central National Herbarium (CAL), Botanical Survey of India for their keen interest and providing necessary facilities. Thanks are also due to the authorities of various Herbaria in India for supplying materials on loan in connection with this study.

REFERENCES

Banerjee, S. P. Identity of *Trichodesma amplexicaule* DC. (non Roth). *Bull. bot. Soc. Beng.* 16 : 9-11. 1962 (Apr. 1964).

——A new species of *Trichodesma* R. Br. from Burma. *Ind. For.* 92 (1) : 56-58. 1966.

Boehmer, G. R. In Ludwig, *Definitiones generum plantarum*. Leipzig. ed. 3, 18. 1760.

Brand, A. In Fedde, *Repertorium specierum novarum regni vegetabilis* 12 : 504. 1914.

——In Engler's *Das Pflanzenreich* IV. 252 *Borraginaceae-Boraginoideae Cynoglosseae* Leipzig. Heft. 78 : 17-44. 1921.

Brown, R. *Prodromus Florae Novae Hollandiae* : 496. 1810.

Burkill, I. H. Notes on the Pollination of Flowers in India Note No. 6. The Spring Flora in the Simla Hills. *Journ. and Proc. Asiat. Soc. Beng.* 4: 227. 1908.

——The Botany of the Abor Expedition. *Rec. bot. Surv. India* 10 (1) : 54, 322. 1924.

Burman, N. L. *Flora Indica* 41. t. 14, f2. 1768.

Chopra, R. N., S. L. Nayar and I. C. Chopra. *Glossary of Indian Medicinal Plants*, New Delhi, 247. 1956.

Clarke, C. B. *Boragineae* in J. D. Hooker's, *The Flora of Brit India* 4 : 153-154. 1883.

Collett, C. B. and W. B. Hamsley. On a collection of plants from Upper Burma and the Shan States. *Journ. Linn. Soc. (Bot.)* 28 : 92-93. 1890.

Collett, H. *Flora Simlensis* 331. 1921.

Cooke, *T. Flora of the Presidency of Bombay* 2: 214-216. 1904.

Dalzell, N. A. and A. Gibson. *The Bombay Flora* 173. 1861.

De Candolle, A. *Prodromus Systematis Naturalis Regni Vegetabilis.* 10 : 172. 1846.

Duthie, J. F. *Flora of Upper Gangetic Plain and of the adjacent siwalik and Sub-Himalayan Tracts.* 2 : 94-95. 1911.

Gamble, J. S. *Flora of the Presidency of Madrcs* 2 : 898-899. 1923.

Haines, H. H. *The Botany of Bihar and Orissa* 4 : 580-581. 1922.

Hutchinson, J. and J. M. Dalziel. *of West Tropical Africa* 2 : 199-200. 1931.

Johnston, I. M. Studies in the Boraginaceae, XXII. Note-worthy species, chiefly Asian and South American. *Journ. Arnold Arbor.* 33 : 75-78. 1952.

Kanjilal, U. N. et al. *Flora of Assam* 3 : 338. 1939.

Kazmi, S. M. A. A Revision of the Boraginaceae of West Pakistan. *Journ. Arnold Arbor.* 51 : 136. 1970. 52 : 515-522. 1971.

Khanna, P. Embryology of *Trichodesma amplexicaule* Roth. *Bull. Torrey bot. club* 91 (2) : 105-114. 1964.

Kitamura, S. *Flora of Afghanistan* 326-327. 1960.

Kuntze, O. *Revisio Generum Plantarum* 2 : 435-436. 1891.

Lacaita, C. C. Plants collected in Sikkim, including the Kalimpong district. *Journ. Linn. Soc.* (*Bot.*) 43 : 3-75. 1916.

Lehmann, I. G. C. *Plantae e Familia Asperifoliarum.* 191-206. 1818.

Linnaeus, C. *Species Plantarum* 137-138. 1753.

Metcalfe, C. R. and L. Chalk. *Anatomy of the Dicotyledons* 2 : 947-948. (Repr. ed.) 1957.

Prain, D. *Bengal Plants* 2 : 719-720. 1903.

——The vegetation of the Districts of Hughli-Howrah and 24-Parganahs. *Rec. bot. Surv. India* 3 (2) : 242-243. 1905.

Puri, G. S. et al. Flora of Rajasthan. *Rec. bot. Surv. India* 19 (1) : 90. 1964.

Ramamoorthy, T. P. *Trichodesma* R. Br. in *Flora of Hassan District, Karnataka, India* (Ed. Saldanha, C. J. & H. Nicolson) 483-484. 1976.

Rau, M. A. Flora of the Upper Gangetic Plain and of the adjacent Siwalik and Sub-Himalayan Tracts -Check List. *Bull. bot. Surv. India* 10 (Suppl. 2) 52. 1968.

Roth, A. W. *Novae plantarum species* 104. 1821.

Santapau, H. The Flora of Khandala on the Western Ghats of India. *Rec. bot. Surv. India* 16 (1) : 165. 1967 (3rd. rev. ed.)

——and A. N. Henry. *A Dictionary of the Flowering Plants in India* 174-175. 1973.

Sedgwick, L. J. On *Trichodesma indicum* R. Br. and *T. amplexicaule* DC. *Rec. bot. Surv. India* 4 : 347. 1913.

Sprague, T. A. The correct spelling of the generic name ; *Borago* VS *Brrago. Kew Bull.* 1928 : 288-292. 1928.

Stafleu, F. A. et al. Ed. *International Code of Botanical Nomenclature.* Utrecht, 1972.

Watt, G. *A dictionary of the economic products of India* 6 (4) : 80. 1893.